THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Professor of Meteorology.

CHARACTERISTICS OF THE WEATHER FOR SEPTEMBER.

Aside from the West Indian hurricane which partially destroyed Galveston, Tex., on the 8th, an account of which will be found on another page of this REVIEW, there were few broad features of especial significance. Perhaps the most significant was the high pressure that prevailed on the middle and south Atlantic coasts and over Virginia, West Virginia, and the Ohio Valley. The weather east of the Rocky Mountains, at least, if not over the entire country, is controlled largely by the distribution of pressure over the Atlantic coast districts. When areas of high pressure persist over those districts areas of low pressure which develop in Alberta or over the northeastern Rocky Mountain slope and move southeastward into the Missouri Valley are forced to move thence a little east of north, passing over Minnesota and Lake Superior and thence eastward generally beyond the field of observation. The effect of the pressure distribution in such cases is to give heavy rains in the British Northwest, Minnesota, and the Lake Superior region, and high temperature with scant rains in the Mississippi Valley, the Lake region south of Superior, and generally eastward to the Atlantic. The fall of rain in the South Atlantic States is also markedly deficient, while far to the westward in Oklahoma, Indian Territory, west Texas, and New Mexico the rainfall is abundant. These conditions prevailed, in great measure, during the current month.

The temperature was abnormally high in eastern districts until about the 12th. The rapid movement of the West Indian hurricane from Iowa to the Canadian Maritime Provinces, on the 11–12th, brought a cessation of the high temperatures that had prevailed almost continuously since the early part of August, yet the month, as a whole, will rank as a warm September.

PRESSURE.

The distribution of monthly mean pressure is graphically shown on Chart IV, and the numerical values are given in Tables I and X.

As stated in the introduction, the South Atlantic high extended inland to the lakes, the region of greatest pressure being over North Carolina, Virginia, and West Virginia. West of the Mississippi River pressure was below normal, ranging from .01 to .05 inch. As compared with the preceding month, pressure rose in all regions except the immediate Pacific coast, the Gulf States, and Florida, the greatest increase being in the Northwest, where a maximum rise of .16 inch was recorded. This increase was, however, simply a recovery from the prevailing low pressure which existed in that region during August.

TEMPERATURE OF THE AIR.

Temperature was above the normal over practically the whole country from the Rocky Mountains eastward to the Atlantic. The region of greatest positive departure, however, extended from eastern Texas northeastward to eastern Pennsylvania. In this central region of greatest abnormality the average daily departure was about 6°.

West of the Rocky Mountains temperature was below normal, as during the preceding month.

Maximum temperatures of 100° and over were registered at voluntary stations of the Weather Bureau in the western part of Virginia, in South Carolina, Louisiana, and quite generally throughout eastern Kansas, Oklahoma, and northern Texas. Temperatures below freezing were observed in northern Minnesota, in the Dakotas, and throughout the Rocky Mountain region, save in New Mexico, and also over the northern and middle Plateaus and northern New England.

The distribution of monthly mean surface temperature, as deduced from the records of about 1,000 stations, is shown on Chart VI.

The average temperature for the several geographic districts and the departures from normal values are shown in the following table:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	63.1	+ 2.3	+ 8.0	+ 0.9
Middle Atlantic	12	71.8	+ 4.8	+13.3	+ 1.5
South Atlantic	10	77.8	+ 3.8	+ 4.6	+ 0.5
Florida Peninsula	7	80.7	+ 2.1	− 3.2	− 0.4
East Gulf	7	80.0	+ 4.0	− 2.4	− 0.3
West Gulf	7	81.1	+ 5.1	+ 6.8	+ 0.8
Ohio Valley and Tennessee	12	74.2	+ 5.7	+ 8.6	+ 1.0
Lower Lake	8	66.8	+ 3.6	+ 6.7	+ 0.7
Upper Lake	9	61.9	+ 2.9	+13.2	+ 1.5
North Dakota	8	56.1	− 1.6	+34.8	+ 3.9
Upper Mississippi Valley	11	67.5	+ 2.6	+14.7	+ 1.6
Missouri Valley	10	66.3	+ 1.2	+23.1	+ 2.6
Northern Slope	7	57.1	− 1.0	+29.8	+ 3.3
Middle Slope	6	68.6	+ 1.3	+17.6	+ 2.0
Southern Slope	6	74.2	+ 2.7	+ 6.9	+ 0.8
Southern Plateau	15	65.2	− 3.4	+ 4.4	+ 0.5
Middle Plateau	9	57.9	− 3.7	+14.1	+ 1.6
Northern Plateau	10	55 8	− 1.4	+22.0	+ 2.4
North Pacific	9	57.2	− 0.3	+12.2	+ 1.4
Middle Pacific	5	63.1	− 0.0	+ 7.8	+ 0.9
South Pacific	4	66.6	− 1.7	+ 7.3	+ 0.8

In Canada.—Prof. R. F. Stupart says:

Temperature was just above average in British Columbia, Quebec, and the Maritime Provinces, below average in Alberta and Assiniboia, a little above average in Saskatchewan and Manitoba, and considerably above in Ontario. Toronto was 6° above average, the warmest September but one (1881) since records have been kept, which is from 1840. Ontario stations were all from 3° to 6° above average, consequently it is fair to assume that this has been the second warmest September during the last sixty years. Alberta was 4° below average, which is remarkable when it is considered that Saskatchewan was actually above average.

PRECIPITATION.

There was a marked excess of rain from central Texas northward to the British Possessions. The fall in central and northern Texas, Oklahoma, Kansas, Minnesota, and northern Wisconsin was remarkably heavy. Over the greater part of this region the average excess was from 4 to 6 inches. Rain was also in excess of the normal locally in New England, eastern Pennsylvania, and in the Appalachian region from southern Pennsylvania to eastern Tennessee. On the north Pacific coast rainfall was from 2 to 4 inches less than

the seasonal average, and there was also a deficiency throughout California and Nevada. Rainfall was also markedly deficient along the Atlantic coast from New Jersey to Florida. This was to be expected, since the distribution of pressure was unfavorable to precipitation.

Traces of snow were recorded in western Nebraska, and at a few places in North Dakota. In the mountain region of Colorado and thence northward to the British Possessions varying amounts of snow were recorded, 14 inches being the greatest. Snow also fell in Nevada and Utah, but there was very little recorded in the mountainous regions of Idaho.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	10	2.63	84	−0.5	− 2.5
Middle Atlantic	12	2.80	74	−1.0	− 6.4
South Atlantic	10	2.47	47	−2.8	− 8.3
Florida Peninsula	7	6.02	81	−1.4	+ 1.7
East Gulf	7	4.22	100	0.0	+ 7.7
West Gulf	7	2.84	70	−1.2	+ 2.8
Ohio Valley and Tennessee	12	1.94	66	−1.0	− 7.6
Lower Lake	8	1.93	66	−1.0	− 1.4
Upper Lake	9	4.13	120	+0.7	− 1.5
North Dakota	8	3.72	305	+2.5	+ 1.6
Upper Mississippi Valley	11	4.73	146	+1.5	− 0.4
Missouri Valley	10	4.00	167	+1.6	+ 1.8
Northern Slope	7	1.74	185	+0.8	− 0.8
Middle Slope	6	3.68	219	+2.0	+ 0.7
Southern Slope	6	7.56	350	+5.4	+ 7.9
Southern Plateau	15	1.73	186	+0.8	− 1.0
Middle Plateau	9	0.90	112	+0.1	− 3.2
Northern Plateau	10	1.27	109	+0.1	− 2.2
North Pacific	9	1.81	56	−1.4	− 1.7
Middle Pacific	5	0.36	55	−0.3	− 4.6
South Pacific	4	0.04	29	−0.1	− 4.3

In Canada.—Professor Stupart says:

Precipitation was below average in Ontario south and west of Lake Simcoe, except locally in the Niagara Peninsula, the deficiency being very generally from an inch to an inch and a half. In New Brunswick it was also for the most part below, St. John being as much as an inch below. The greater portion of British Columbia was also below average, many localities giving over an inch. Elsewhere throughout the Dominion it was above the average. The abnormally heavy precipitation in the Territories and Manitoba was most remarkable; at Edmonton the normal was exceeded by 4 inches, at Calgary by 3 inches, and at Winnipeg by nearly 2.5 inches. Several heavy falls of snow occurred in the Territories, which is also very unusual so early in the season. At Ottawa the rainfall was 1.5 inches above the average, at Father Point it was 2 inches above, and at Halifax 1.3 inches above.

HAIL

The following are the dates on which hail fell in the respective States:

Arizona, 21, 23, 30. California, 2, 13. Colorado, 8, 9, 11, 21, 24, 25. Idaho, 15, 23. Illinois, 15, 26. Iowa, 13, 14, 16, 25. Kansas, 14. Missouri, 2, 14, 15, 18, 22. Nebraska, 6, 14, 18, 22, 27. Nevada, 3, 17, 23, 24. New Mexico, 8, 12, 18. New York, 3. North Dakota, 13, 14, 18. Ohio, 26. Oregon, 5, 7, 15. South Dakota, 1, 11, 14, 18. Tennessee, 16. Texas, 20. Washington, 7, 22, 30. Wyoming, 3, 5, 9, 10, 21.

SLEET.

The following are the dates on which sleet fell in the respective States:

Arizona, 23. Colorado, 25, 27. Michigan, 16. Nevada, 23, 24. North Dakota, 25, 26.

HUMIDITY.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	81	− 1	Missouri Valley	73	+ 6
Middle Atlantic	76	− 1	Northern Slope	65	+12
South Atlantic	78	− 3	Middle Slope	66	+ 8
Florida Peninsula	82	0	Southern Slope	72	+10
East Gulf	75	− 2	Southern Plateau	39	− 8
West Gulf	80	+ 6	Middle Plateau	40	+ 3
Ohio Valley and Tennessee	71	− 2	Northern Plateau	56	+ 4
Lower Lake	72	− 2	North Pacific Coast	78	− 3
Upper Lake	82	+ 6	Middle Pacific Coast	64	− 4
North Dakota	79	+14	South Pacific Coast	60	− 5
Upper Mississippi	76	+ 4			

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

The averages for the various districts, with departures from the normal, are shown in the table below:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	5.0	0.0	Missouri Valley	4.7	+0.7
Middle Atlantic	4.5	−0.3	Northern Slope	4.6	+0.6
South Atlantic	3.1	−1.7	Middle Slope	4.7	+1.5
Florida Peninsula	5.1	−0.4	Southern Slope	4.5	+0.9
East Gulf	3.1	−1.3	Southern Plateau	3.0	+0.7
West Gulf	4.6	+0.3	Middle Plateau	3.4	+0.9
Ohio Valley and Tennessee	4.4	0.0	Northern Plateau	4.6	+0.5
Lower Lake	5.0	+0.2	North Pacific Coast	5.2	+0.3
Upper Lake	5.7	+0.6	Middle Pacific Coast	3.4	+0.6
North Dakota	5.5	+1.2	South Pacific Coast	2.2	−0.3
Upper Mississippi	4.8	+0.6			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex	24	50	s.	Lincoln, Nebr	11	56	n.
Boston, Mass	12	52	w.	Mount Tamalpais, Cal.	5	51	nw.
Buffalo, N. Y	12	78	w.	Do	15	67	nw.
Chicago, Ill	2	53	s.	Do	21	52	n.
Do	11	72	sw.	Do	23	62	nw.
Cleveland, Ohio	12	60	sw.	Do	24	56	nw.
El Paso, Tex	21	50	nw.	New York, N. Y	12	65	nw.
Do	23	51	nw.	Point Reyes Light, Cal.	23	72	nw.
Fort Worth, Tex	9	52	se.	Sioux City, Iowa	14	70	se.
Galveston, Tex	8	84*	ne.	Yankton, S. Dak	14	54	s.

*The anemometer cups were blown away at 5:30 p. m., at which time the wind was blowing at 84 miles per hour. It is estimated that later the wind attained a velocity of 120 miles per hour from the southeast.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table VII, which shows the number of stations from which meteorological reports were received, and the

number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 2,563 thunderstorm were received during the current month as against 2,203 in 1899 and 5,736 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 2d, 192; 1st, 152; 3d, 142; 26th, 137.

Reports were most numerous from: Missouri, 243; Illinois, 177; New York, 126; Iowa, 123.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, 4th to 13th.

In Canada.—Auroras were reported as follows: Father Point, 18th, 19th, 28th; Minnedosa, 4th, 16th, 27th, 28th, 30th.

Thunderstorms were reported as follows: Yarmouth, 17th, 18th; Charlottetown, 12th, 22d; Father Point, 27th; Quebec, 3d, 21st, 26th; Montreal, 3d, 6th; Bissett, 16th, 21st; Ottawa, 16th, 21st, 26th, 27th; Kingston, 6th, 16th, 21st, 26th; Toronto, 3d, 6th, 11th, 15th, 16th, 21st, 26th; White River, 2d, 3d, 15th, 25th; Saugeen, 11th, 21st; Parry Sound, 6th, 11th, 12th, 16th, 20th; Port Arthur, 1st, 2d, 4th, 5th; Winnipeg, 22d; Minnedosa, 24th; Qu'Appelle, 9th; Swift Current, 8th, 9th; Hamilton, 18th, 24th, 29th, 30th.

ERRATA.

June REVIEW, 1900, page 243, "Observations at Honolulu," line 18, for "has always been," read "is." Page 250, line 20 from bottom, for "Upsala," read "Christiania." Page 251, column 1, lines 11 and 12 from bottom, for "he" and "ower," read "the" and "lower."

In the article "Forecasting for the Farmer," July, 1900, REVIEW, page 288, first column, fourth paragraph, first line should read "While drying weather is most hoped for," instead of "While drying weather is not hoped for."

DESCRIPTION OF TABLES AND CHARTS.

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Table I gives, for about 145 Weather Bureau stations making two observations daily and for about 25 others making only one observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation, the total depth of snowfall, and the mean wet-bulb temperatures. The altitudes of the instruments above ground are also given.

Table II gives, for about 2,700 stations occupied by voluntary observers, the highest maximum and the lowest minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station; the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (. . . .).

Table III gives, for 44 stations selected out of 144 that maintain continuous records, the mean hourly temperatures deduced from the Richard thermographs described and figured in the Report of the Chief of the Weather Bureau, 1891–92, p. 29.

Table IV gives, for 44 stations selected out of 142 that maintain continuous records, the mean hourly pressures as automatically registered by Richard barographs, except for Washington, D. C., where Foreman's barograph is in use. Both instruments are described in the Report of the Chief of the Weather Bureau, 1891–92, pp. 26 and 30.

Table V gives, for about 157 stations, the arithmetical means of the hourly movements of the wind ending with the respective hours, as registered automatically by the Robinson anemometer, in conjunction with an electrical recording mechanism, described and illustrated in the Report of the Chief of the Weather Bureau, 1891–92, p. 19.

Table VI gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions based on these two observations only and without considering the velocity of the wind The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I. By adding the four components for the stations comprised in any geographical division the average resultant direction for that division can be obtained.

Table VII gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table VIII gives, for about 95 stations, the average hourly sunshine (in percentages) as derived from the automatic records made by two essentially different types of instruments, designated, respectively, the thermometric recorder and the photographic recorder. The kind of instrument used at each station is indicated in the table by the letter T or P in the column following the name of the station.

Table IX gives a record of rains whose intensity at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes..	5	10	15	20	25	30	35	40	45	50	60	80	100	120
Rates pr. hr. (ins.)..	3.00	1.80	1.40	1.20	1.08	1.00	0.94	0.90	0.86	0.84	0.75	0.60	0.54	0.50

In the northern part of the United States, especially in the colder months of the year, rains of the intensities shown in the above table seldom occur. In all cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest rainfall of any single storm has been given, also the greatest hourly fall during that storm.

Table X gives, for about 30 stations furnished by the Canadian Meteorological Service, Prof. R. F. Stupart, director, the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

Table XI gives the heights of rivers referred to zeros of gages.

NOTES EXPLANATORY OF THE CHARTS.

Chart I, tracks of centers of high areas, and Chart II, tracks of centers of low areas, are constructed in the same way. The roman numerals show number and chronological order of highs (Chart I) and lows (Chart II). The figures